

Arkansas NSF EPSCoR Summer 2017 Newsletter



The Center For Advanced
Surface Engineering



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SPOTLIGHT

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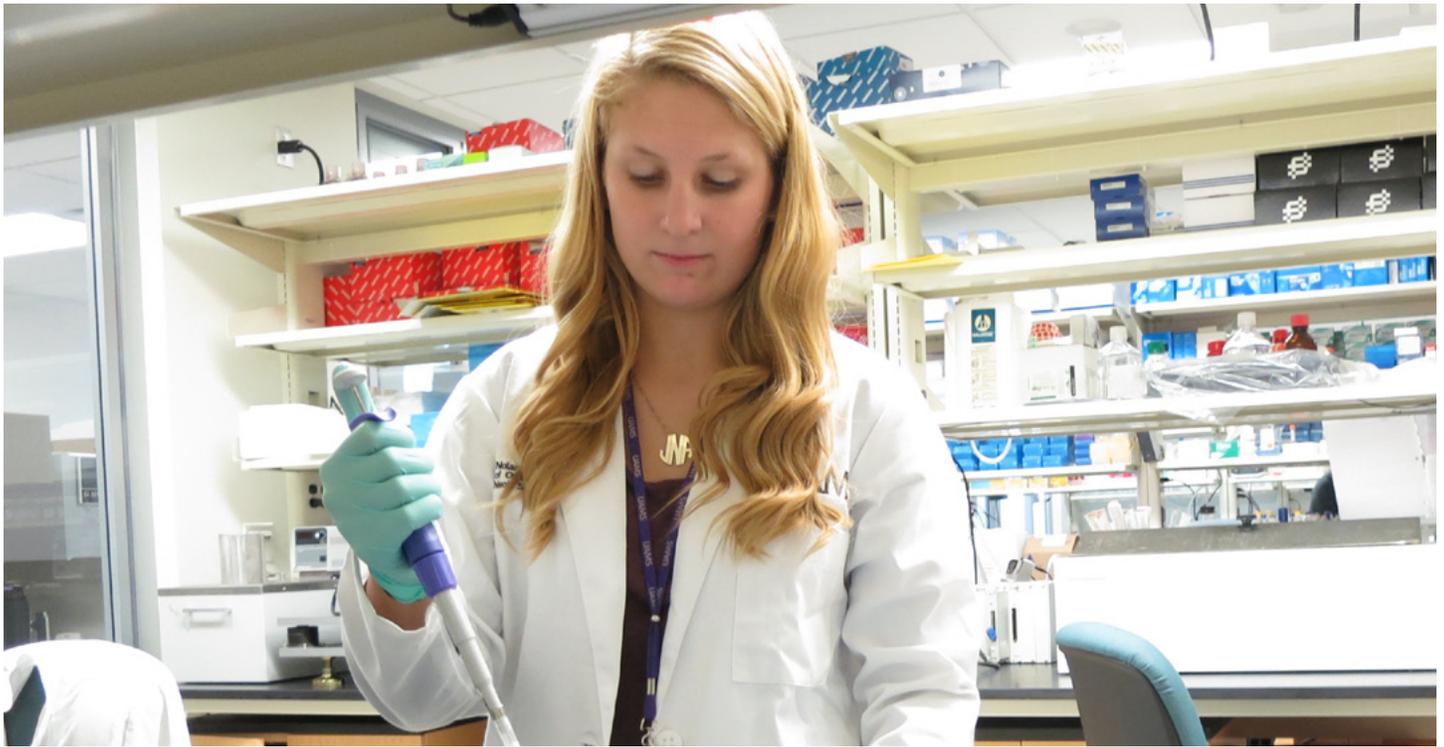
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STUDENT SPOTLIGHT Jacqueline Nolan



Jacqueline is a graduate student at the University of Arkansas for Medical Sciences. She has been passionate about medical science since childhood, and took several science courses during high school. Her undergraduate degree was in biology, and is now in the Interdisciplinary Biomedical Sciences program at UAMS. She is currently researching cancer detection in the blood stream, as well as working on the Center for Advanced Surface Engineering project.

“I want to find better ways to see if the cancer treatment is working properly. If the patient is not responding to the treatment, there could be another type of treatment that the patient will respond to. Better detection can lead to being able to find the right treatment faster. The normal test requires blood to be drawn from the patient, so right now we are working on a test that does not require blood to be drawn. We are using lasers to detect cancer cells in circulation through the skin. Some of the different tests require fluorescent labeling, but the method that I am working on does not.

“The hardest challenge for me is discussing science with people that have a higher level of knowledge, like my committee. Public speaking makes me nervous, but I am working on it. After I graduate I plan to go into industry, possibly at a pharmaceutical company to develop new medicines.”

From Arkansas National Science Foundation EPSCoR &
the Arkansas School for Mathematics, Sciences, & the Arts

SUMMER RESEARCH INSTITUTE

PROFESSIONAL DEVELOPMENT CAMP
FOR UNDERGRADUATE STEM STUDENTS

The 3rd annual
Summer
Research
Institute
is in the books.

Congratulations to
this year's alumni
and many thanks to
the organizers and
presenters!





Session 1



Session 2

So what's it all about?

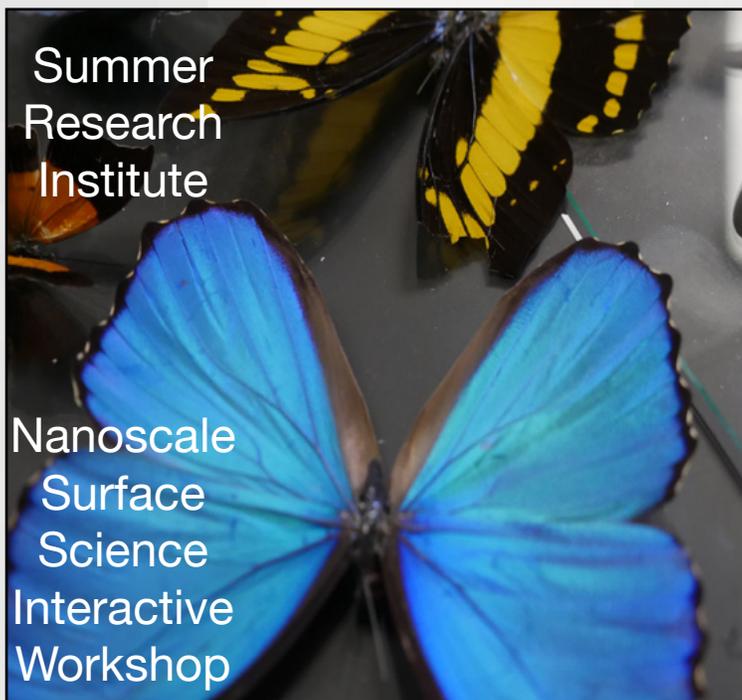
Writing for Publication
Responsible Conduct in Research
STEM Careers Panel
Intro to MatLab
PCR Lab with GMO Genes
Nanoscale Surface Science Lab



Green & Sustainable Chemistry
MCAT & GRE Prep
Electrophoresis Lab
Intro to 3D Printing
How to Read a Research Paper
Protein Chromatography & Quantification
Experimental Design
Graduate School Panel
Building a Resume
Intro to CAD
Research Consultations



2018 dates will be announced via social media (@arepscor) in August. Some scholarships available.



Greg Salamo (Physicist, UARK) and two of his graduate students Mohammed Zamani Alavijeh & Tim Morgan conducted a nanoscale surface science workshop using butterfly wings. Students viewed assorted butterfly wings in a scanning electron microscope (SEM) that can see materials at nanoscale, as well as viewing them through an optical microscope.

Highlights from the 2017 Arkansas NSF EPSCoR All-Hands Meeting June 2 & 3 at Little Rock, AR

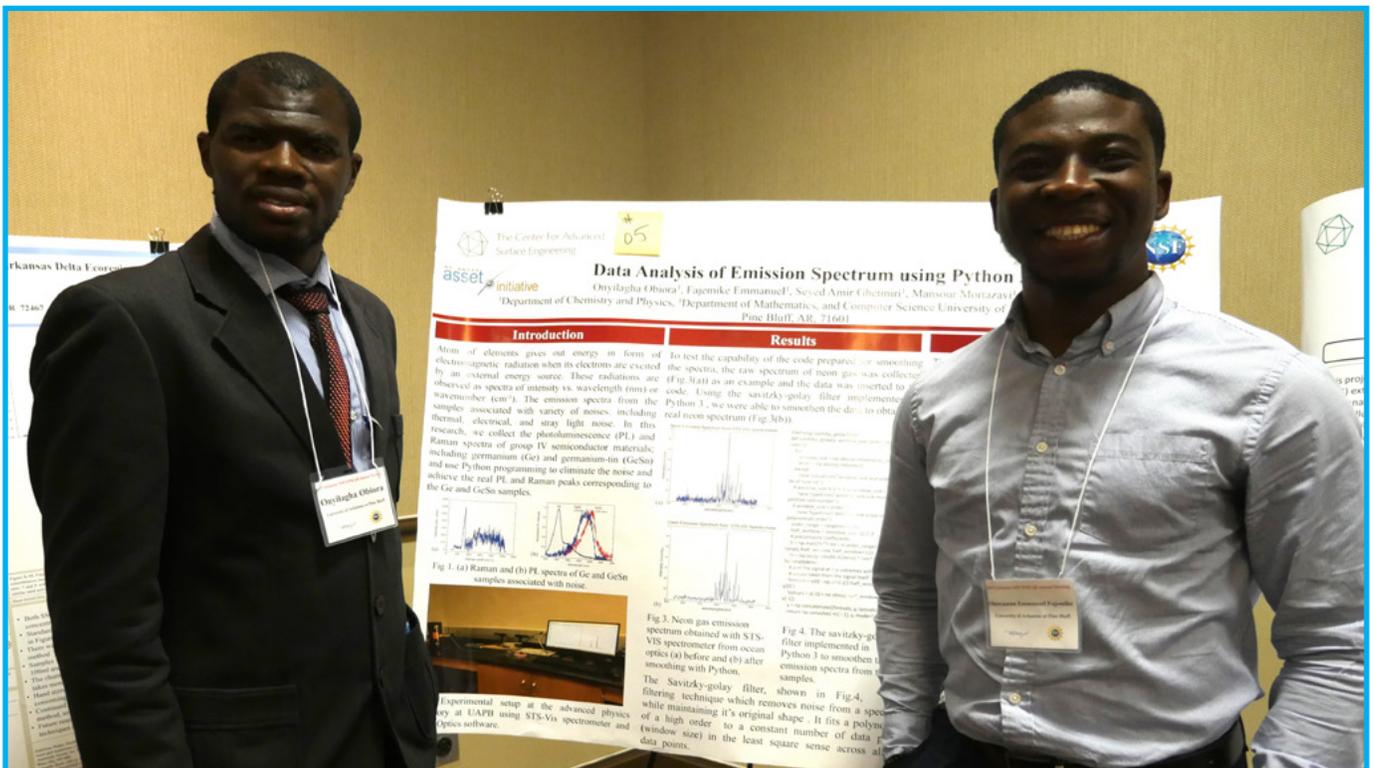


Charles Morgan, Chairman & CEO at First Orion was the keynote speaker for the event. He spoke about the future of data science, big data, and how Arkansas can prepare.

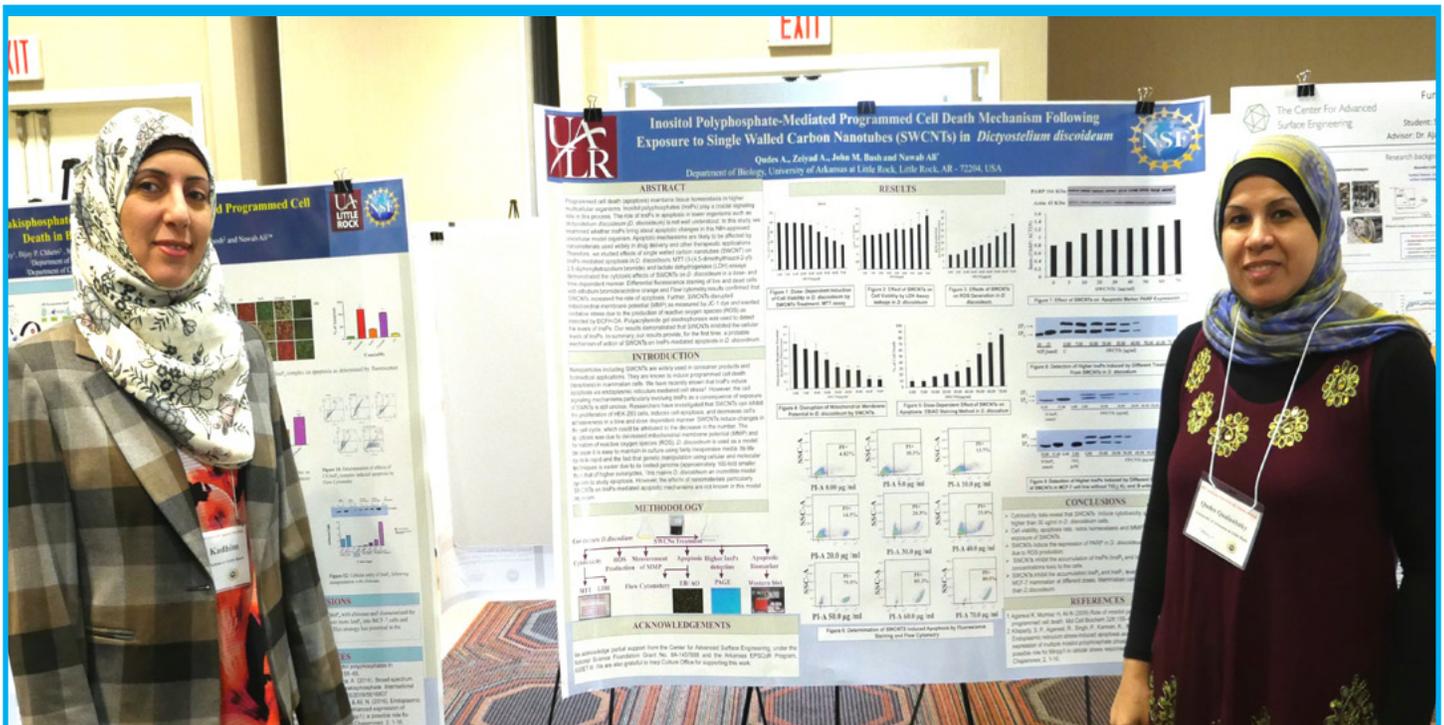
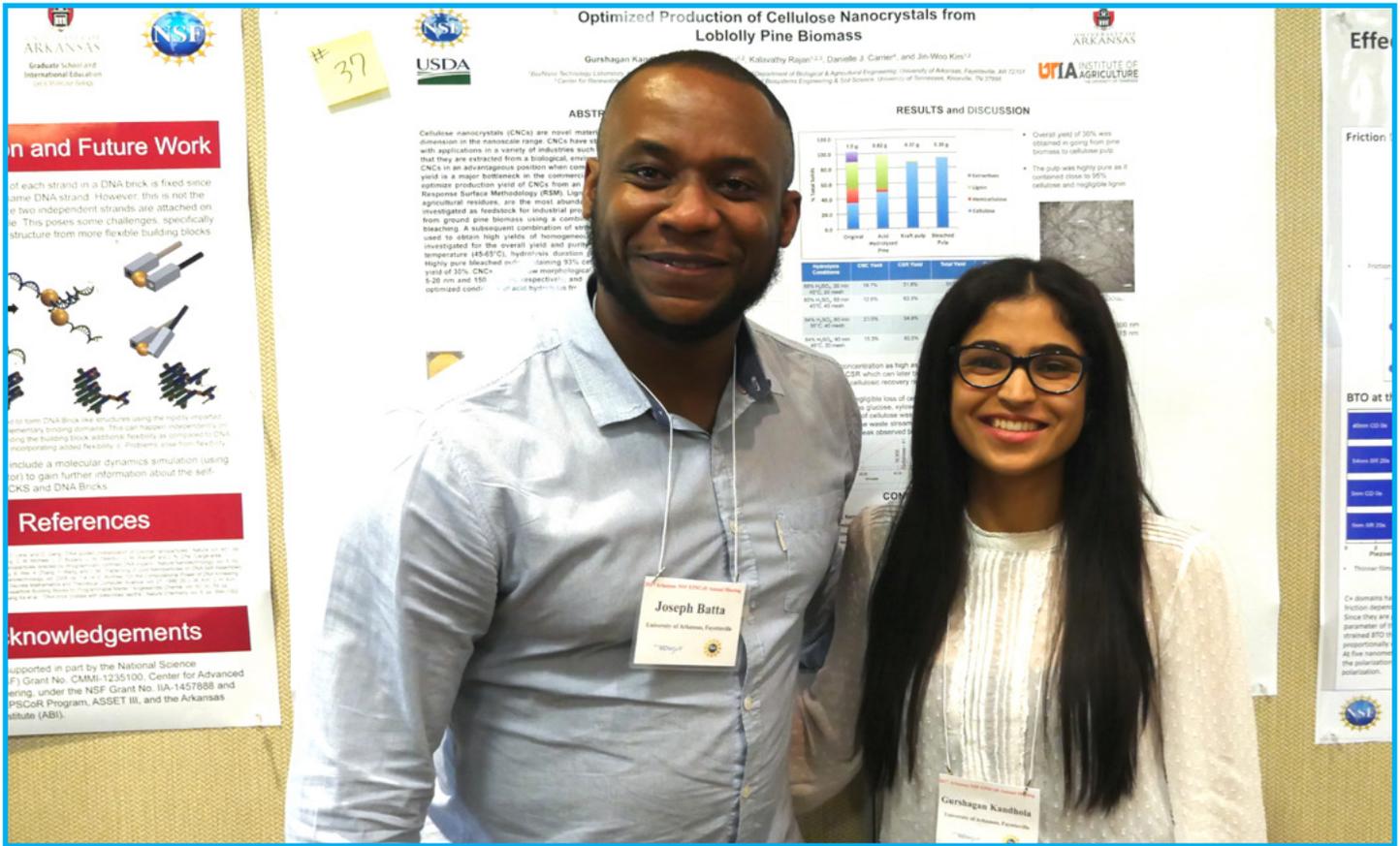


Marla Moland (pictured above presenting a poster) is a graduate student at Arkansas State University and a current participant in Bridging The Divide, an EPSCoR Track-3 program administered by Dr. Malathi Srivatsan.

Onyilgha Obiora (pictured below, left) and Oluwaseun Emmanuel Fajemike (pictured below, right) are both students in Dr. Mansour Mortazavi's lab at the University of Arkansas at Pine Bluff. They presented posters on data analysis using Python.



Joseph Batta-Mpouma (pictured below, left) and Gurshagan Kandhola (pictured below, right) are both graduate students in Dr. Jin-Woo Kim's lab at the University of Arkansas at Fayetteville. They presented their work via poster during the 2017 annual meeting.



Ilham Kadhim (left) and Qudes AL-Anbaky (right), graduate students at the University of Arkansas at Little Rock, present their posters for competition at the annual meeting.

Approximately 40 students participated in the poster competition that took place during the 2017 Annual All-Hands Meeting. The students were grouped in undergraduate or graduate student categories and were judged by a panel of faculty and external reviewers. Read about the research projects of the winning students on the following pages.

Congratulations to the 2017 AR NSF EPSCoR Annual Meeting Poster Competition Winners

Kimberly Richardson (A-State),
Mahyar Afshar Mohajer (UARK),
& Jason Steck (UARK)

A-State graduate student Kimberly Richardson (pictured right) presents her poster at the competition. Kimberly is currently a participant in the EPSCoR Track-3 program, Bridging The Divide. She is working on a master's degree in molecular biology.

Her project examined the role of a certain type of protein in pancreatic cancer cells. The protein she studied is common and is found in insects, plants, and mammals. Her research results showed that the presence of the protein slowed the spread of pancreatic cancer.



Kimberly is looking forward to continuing her higher education by pursuing a doctoral degree, potentially at A-State. Her research interests are treatments for infectious diseases, like meningitis, and she is currently working on a project with streptococcus pneumoniae.

Kimberly won best poster among the Track-3 students at the competition and will attend the 25th Annual NSF EPSCoR National Conference in Missoula, MT this fall.

BEST RESEARCH POSTER

GRADUATE STUDENT CATEGORY



Mahyar Afshar Mohajer (pictured above) is a PhD student at the University of Arkansas at Fayetteville. He is originally from Iran and completed his undergraduate degree in Manufacturing Engineering and his master's degree in Materials Engineering in Malaysia. He was looking in the US for a good doctorate program when he learned of the work that Dr. Zou was doing in Fayetteville. His experience and interest matched Dr. Zou's research, and he was offered the position and came to Arkansas.

One of Mahyar's research projects studies how moving parts interact at micro- and nano- scale. For reference, a single red blood cell is about 7 micrometers wide and a DNA helix within a cell is about 2 nanometers wide. When you shrink something with moving parts to microscale, for example gears or a simple machine, the friction properties change and it's difficult to get the parts to move at all. The systems Mahyar and others in Dr. Zou's lab are studying are called microelectromechanical systems (MEMS) or at nano scale (NEMS).

If researchers could get micro- or nano-motors to work efficiently, it could have a major impact on technology. An example of a global application would be smaller and better accelerometers. Accelerometers are sensors that measure acceleration, vibration, seismic activity, and movement. They are commonly used in vehicles, consumer electronics, buildings, machinery, pumps, compressors, fans, and other manufacturing equipment.

The key is to find the perfect combination of surface properties to reduce friction, maximize durability, and reduce wear. One technique that can reduce friction is to texture the surface at nanoscale. CASE has a new piece of equipment called NanoScribe that can 3D print very complex, digitally designed patterns at nanoscale. Mahyar is using the NanoScribe to experiment with different printed designs that might reduce friction and increase durability.

"This work is a stepping stone towards our ultimate goal of multiscale, multi-functional surfaces. The freedom to fabricate carefully designed surfaces is also advantageous for computational modeling and simulation, collaboration with computational modeling teams in CASE were established to optimize the surface."



BEST RESEARCH POSTER

UNDERGRAD
STUDENT
CATEGORY

Jason Steck (pictured above) is currently an undergraduate senior at the University of Arkansas at Fayetteville. He originally was interested in chemical engineering, but after taking some classes and learning more about the career and research opportunities, he transferred to Mechanical Engineering and got a position working in Dr. Zou's lab. He will graduate in December and is currently looking at graduate programs in Materials Science and Materials Engineering.

Like Mahyar (previous page), Jason is researching how to implement more durable, low-friction surfaces in micro/nanoelectromechanical systems (MEMS/NEMS). The materials Jason works with are surfaces that are textured on the nanoscale with rigid dome-like dots. This material holds potential for helping with many of the issues related to MEMS & NEMS, but the dots are susceptible to permanent deformation, and they wear out too quickly for practical use. In order for a material to be implemented in real life, it has to last much longer.

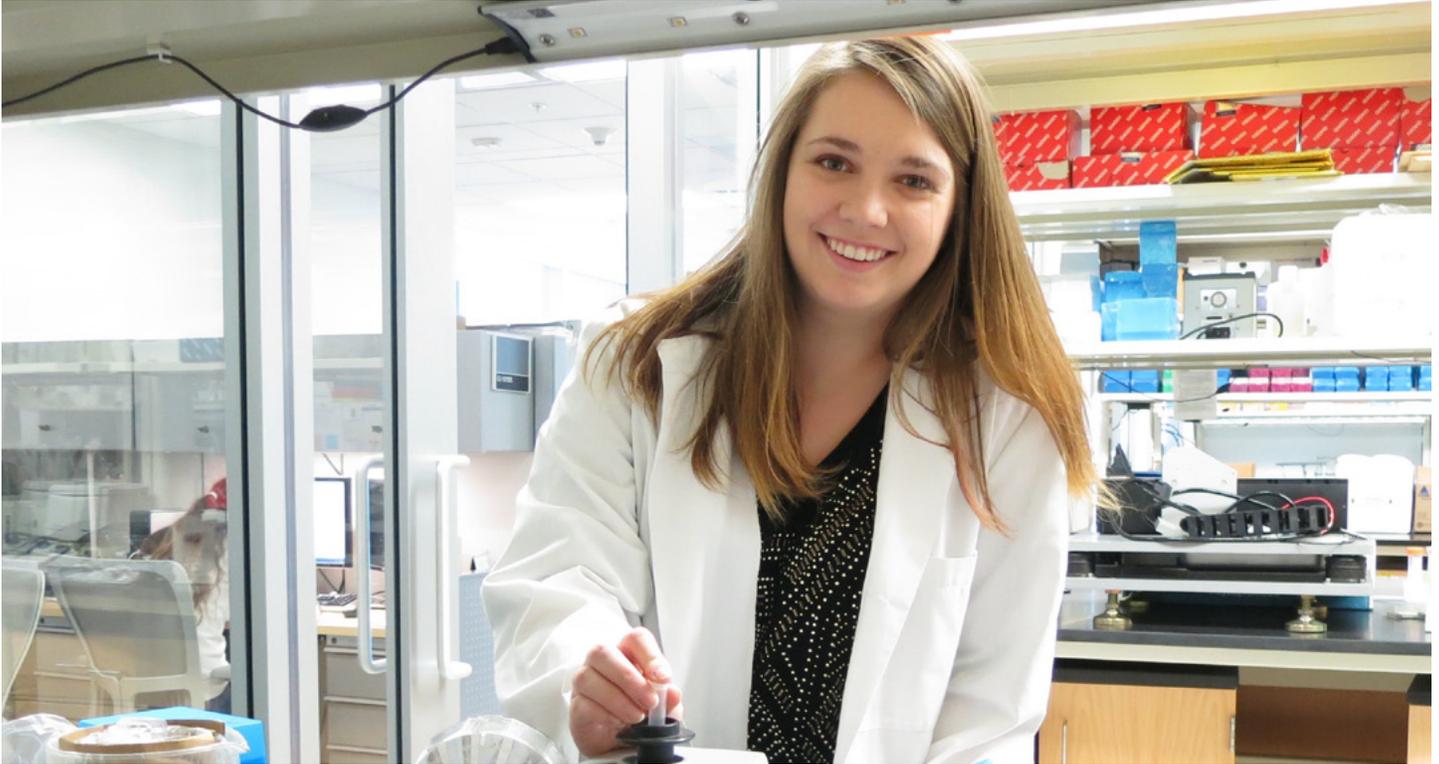
Jason conducts fatigue testing on the textured material and experiments with the material composition to see what will increase the life of the surface. The application for this could be more durable and efficient hard drives, which would have global impact. "Right now, if you drop your computer and the hard drive surfaces scrape together, you will lose data. If researchers can make those surfaces extremely low-friction and durable, the data could be preserved even if the hard drive is dropped. Hard drives on average spin at about 5,000 revolutions per minute, so we need to make sure the surfaces made in the lab can withstand that type of use."



As winners of the poster competition, Kimberly, Mahyar, & Jason will attend the 25th Annual NSF EPSCoR National Conference in Missoula, MT this fall to present their research.

STUDENT SPOTLIGHT

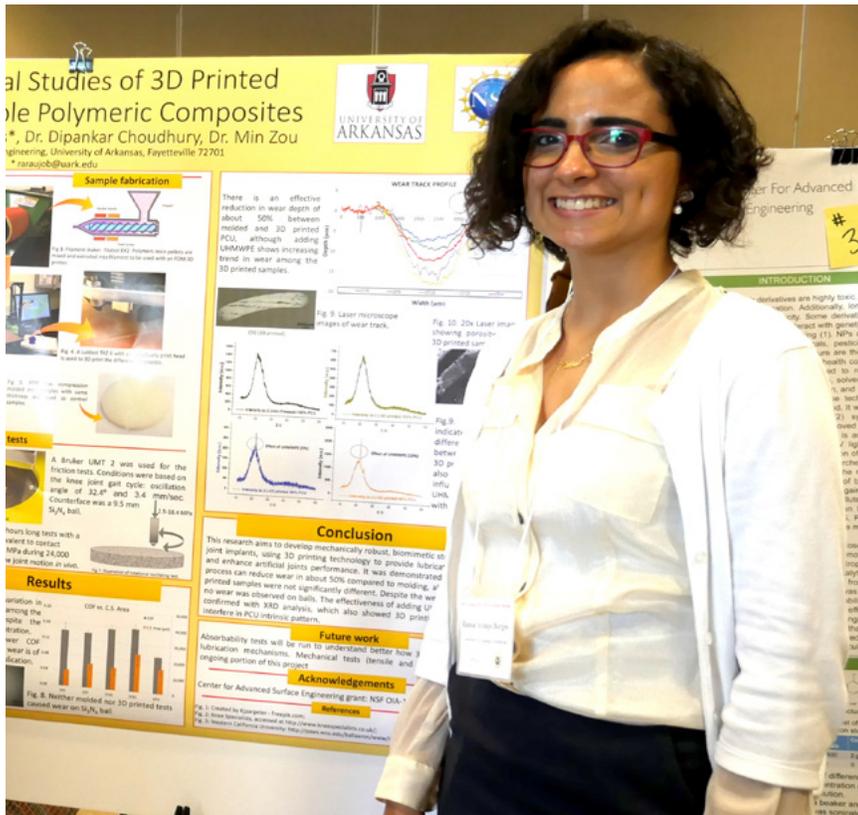
Julia Alex Watts



Julia is an Arkansas native and is currently in the Interdisciplinary Biomedical Sciences graduate program at the University of Arkansas for Medical Sciences. She is working on a research project using nanotechnology to create diagnostic tools for problems in the lymphatic system.

“I chose this program so that I could have more options, and do different types of research instead of focusing on one main area. As a kid, I was always interested in science. When I started school I enrolled in the pre-medical program, but after taking chemistry classes, and really liking it, I realized that I enjoyed the lab and wanted to do research instead of working in a clinic. Graduate School is different and more challenging, balancing lab work and class work, but I am getting used to the extra work and I am enjoying it. My family is nearby, which helps me get through this and I am glad to have them.”

“I love learning all the new techniques. Sometimes it takes a few tries to understand a technique, but in this field failure is something you have to get used to. Not every experiment or technique is going to work out like you want. If your experiment doesn't work, it's not the end of the world. Get over it and try again! I would tell any undergraduate: Don't pick a research subject because there is more funding for it. Find your passion like I have. If you are not passionate about your research then you are going to have a miserable time.”



We recently interviewed **RAISSA ARAUJO BORGES** and talked about her graduate research in materials engineering. Go watch the video to see her idea for improving bone replacement implants.



NEW VIDEOS
@arepscor



CHAMELEONS CHANGE COLOR BY SHIFTING NANOPARTICLES
If you think that's cool- check out our new video that explains surface material science and how that relates to chameleons.



Join the EPSCoR community online!

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arkepscor.org

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